Oct. 28, 1930. N. M. LOWER 1,779,608

STEAM ENGINE

Original Filed April 13 ,1915 2 Sheets-Sheet 1

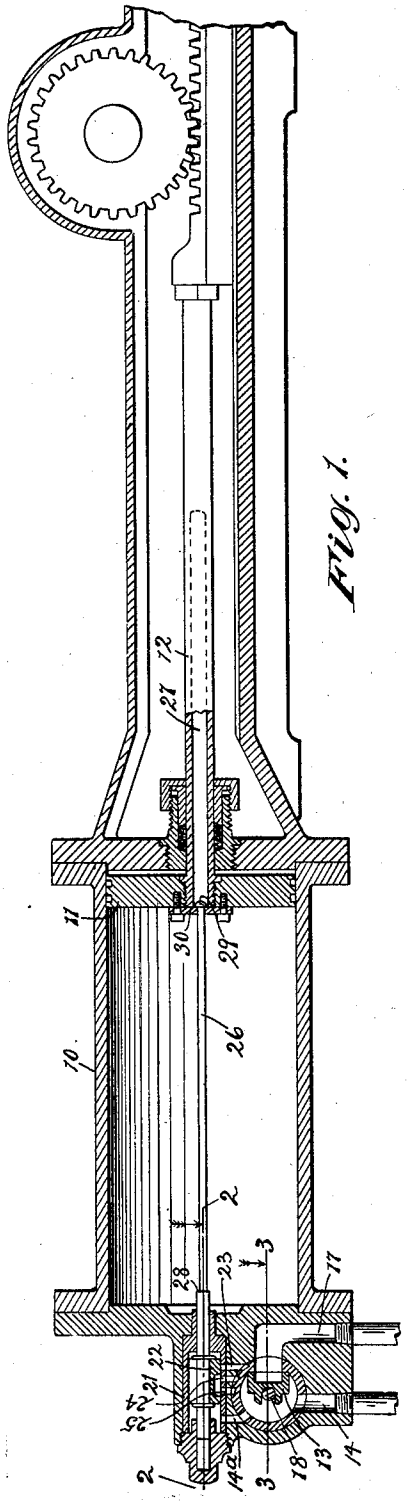


Fig. 1.

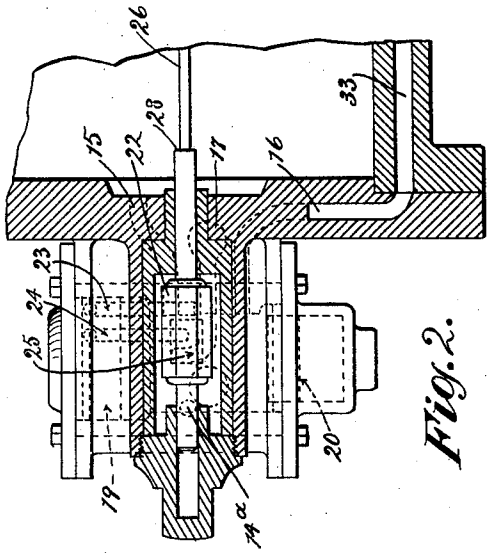


Fig. 2.

Inventor:
Nathan M. Lower
By Wilson & Wilson
Atty's.

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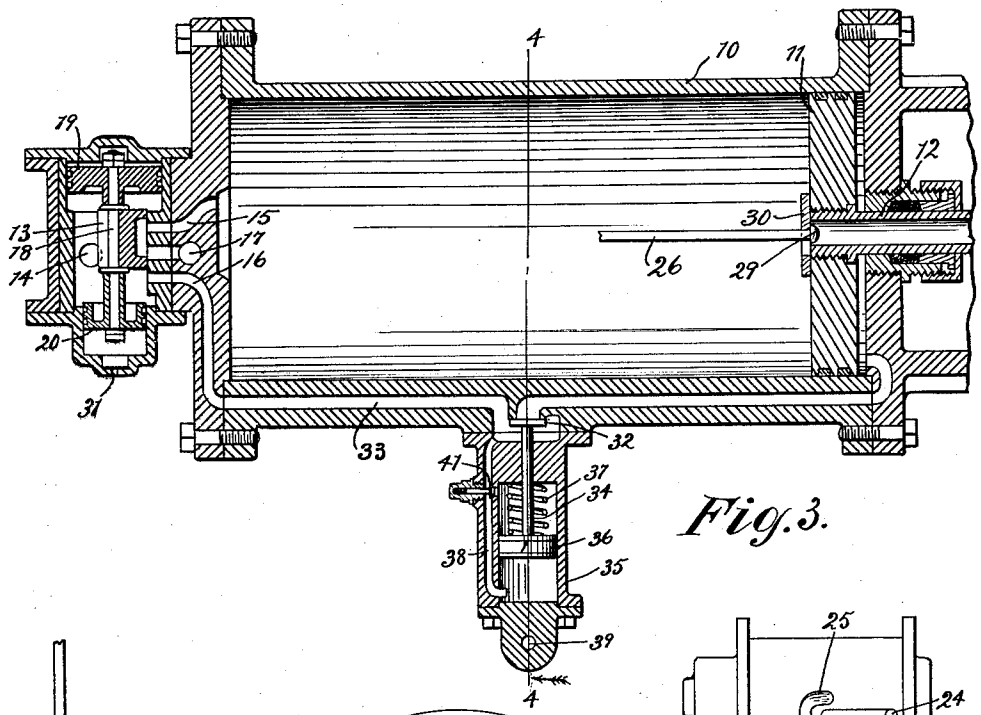


Fig. 3.

Fig. 5.

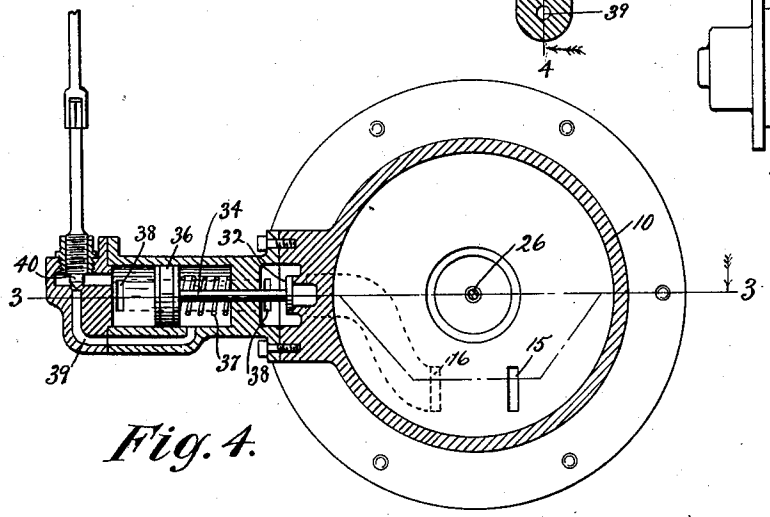


Fig. 4.

Inventor:
Nathan M. Lower
By Gillson & Gillson
Attys.

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UNITED STATES PATENT OFFICE

NATHAN M. LOWER, OF BELLEVUE, PENNSYLVANIA, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE STANDARD STOKER COMPANY INC., OF NEW YORK, N. Y., A CORPORATION OF DELAWARE

STEAM ENGINE

Original application filed April 13, 1915, Serial No. 21,009. Divided and this application filed May 31, 1922. Serial No. 564,732.

The invention relates to that type of reciprocating steam engines in which the steam distributing valve is controlled by the piston and its object is to provide for the regulation of the engine.

The invention consists of the structure hereinafter described and defined in the claims and as illustrated in the accompanying drawings, of which

Figure 1 is a detail longitudinal central sectional view of the engine;

Fig. 2 is a detail section on the line 2—2 of Fig. 1;

Fig. 3 is a detail longitudinal section of the motor on plane normal to that of Fig. 1, the valve mechanism being shown on line 3—3 of Fig. 1;

Fig. 4 is a sectional view on the line 4—4 of Fig. 3; and

Fig. 5 is a detail of the valve casing.

This application is a division of my application upon which was issued Letters Patent No. 1,377,259, May 10, 1921.

The cylinder of the engine is represented at 10, its piston at 11, its piston rod at 12, and its distributing valve at 13.

Steam is supplied to the casing of the valve 13 through the port 14. The valve 13 is of the ordinary D-type and cooperates with the ports 15, 16, leading to opposite ends of the cylinder 10, and with an exhaust port 17 with which either of the ports 15, 16, may be brought into communication through the valve cavity.

The valve 13 is mounted upon a stem 18 upon the opposite ends of which are mounted pistons 19, 20, differentiated in size and working within corresponding bores in the valve casing. By reason of the differentiation in size of the pistons 19, 20, the valve is normally held in the position shown in Fig. 3 by the pressure of the steam entering through the port 14.

The port 14a leads to a valve casing 21, the axis of which is in alignment with the axis of the cylinder 10, within which casing reciprocates a controlling valve 22 of D-type. The valve 22 cooperates with the steam port 23 leading to the casing of the valve 13 and delivering steam to the outer face of the piston 19. It also cooperates with exhaust ports 24, 25, the former communicating with the same end of the casing of the valve 13 as does the port 23, and the latter leading to a suitable outlet.

The stem 26 of the controlling valve 22 projects into the cylinder 10 to within a short distance of its farther end and enters an aperture in the piston 11. The piston rod 12 is recessed from its inner end, as shown at 27, a distance as great as the length of the stem 26. The outer end of the valve stem 26 is headed, as shown at 29, or provided with any suitable lateral projection, for engaging the inner face of an apertured plate 30, secured to the inner face of the piston 11. The stem 26 is provided with a shoulder 28 for engagement by the plate 30 at the end of the instroke of the piston 11.

As the piston 11 approaches the end of its instroke the plate 30 engages the shoulder 28 and shifts the valve 22 to uncover the port 23 and close the port 25, whereupon the valve 13 is shifted from the position shown in Fig. 3, to open the port 15 to live steam and bring the port 16 into communication with the exhaust port 17. A vent opening 31 back of the piston 20 prevents cushioning of this piston.

As the piston 11 approaches the end of its outstroke the head 29 is engaged by the plate 30 and the valve 22 is shifted to the position shown in Fig. 1, thereby closing the port 23 and bringing the exhaust ports 24, 25, into communication and permitting the preponderating pressure upon the inner face of the piston 19 to shift the valve 13 to the position shown in Fig. 3.

As thus far described the engine and its valve mechanism are old. In applying an engine of this type to certain classes of machinery, such, for example, as stoking mechanisms, it is desirable to provide for the regulation of the speed of operation. For this purpose there is shown a control or choke valve 32 in the duct 33 leading from the port 16. The stem 34 of this valve projects into the chamber of a cylinder 35, which is attached to the cylinder 10 and carries at its inner end a piston 36 working within the

former cylinder. An expansion spring 37, reacting between the piston 36 and the end of the cylinder 35, which is adjacent to the valve 32, normally holds the valve away from its seat, leaving the duct 33 open. A duct 38 leads from the duct 33 to the outer end of the cylinder 35, and consequently when the port 16 is uncovered to admit live steam, pressure is immediately applied to the outer face of the piston 36, and the valve 32 is closed in opposition to the spring 37. Since the cylinder 35 is of small cross sectional area as compared with the cylinder 10, the valve 32 will be closed before sufficient steam has entered the cylinder 10 to move the piston 11 or, at any rate, this valve will be closed at the very inception of the movement of the piston 11 on its return or idle stroke. A check valve 41 controls a port opening from the upper end of the cylinder 35 to the duct 38, and permits a reduction of pressure above the piston 36 during the outstroke of the piston 11. The instroke of the piston 11 is, therefore, delayed until the valve 32 is again open. The length of time of the delay will depend on the adjustment of the valve 40. By closing this valve entirely the engine may be stopped.

The valve 32 is gradually opened by the admission of steam from the inner end of the cylinder 35 through a restricted by-pass 39 to the inner end of the cylinder, thus providing a balance of pressure upon the two faces of the piston 36 and permitting the spring 37 to act. A manually controlled needle valve 40 is applied to the by-pass 39 for reducing its effective sectional area, whereby the equalizing of the pressure in the two ends of the cylinder 35 may be further delayed.

The by-pass 39 may be so proportioned relatively to the duct 38 that no movement of the piston 36 will occur upon the uncovering of the port 16, and consequently the valve 32 will remain unseated and the engine will be operated at its maximum speed. By cramping the by-pass by means of the needle valve 40 the instroke of the piston 11 may be delayed and the desired regulation of the engine secured.

In the construction as illustrated there is no delay of the outstroke of the engine piston, an arrangement which is desirable in connection with the use of the engine for operating stoker mechanism as shown in the application of which this is a division.

While an effective and preferred form of construction is herein shown and described, I do not desire to be limited specifically thereto, as the scope of my invention will include any means for regulating an engine of the type shown by delaying the admission of steam to its cylinder after its piston has reached the end of its stroke.

I claim as my invention—

1. The combination with a steam engine comprising, a cylinder, a piston therefor, a distributing valve, said engine being provided with passages for conducting steam from said valve to each side of said piston and for conducting the discharge therefrom, and means actuated by the engine piston for controlling such valve, of a spring opened valve cooperating with a passage leading from the distributing valve to the engine cylinder for controlling the number of reciprocations of said piston per unit of time, a piston actuated by steam from such passage for seating the valve, and a by-pass for equalizing the steam pressure on opposite faces of the piston.

2. The combination with a steam engine comprising a cylinder, a piston therefor, a distributing valve, said engine being provided with passages for conducting steam from said valve to each side of said piston and for conducting the discharge therefrom, means actuated by the engine piston for controlling such valve, of a spring opened valve cooperating with a passage leading from the distributing valve to the engine cylinder for controlling the number of reciprocations of said piston per unit of time, a piston actuated by steam from such passage for seating the valve, a by-pass for equalizing the steam pressure on opposite faces of the piston, and manually controlled means for restricting the by-pass.

NATHAN M. LOWER.